

Part  
**B**

Section 15: Marbled Murrelet  
At-Sea Survey Data



1. RSL Marbled Murrelet Data: At Sea  
800 meter transect

800 m	N Samples									
	1989	1990	1991	1992	1993	1994	1995	1996	1997	Sum
1 ORPS			24	25	12			45	98	204
2 PSCB	53	50	40	15	26	12		8	4	208
3 CBNC	52	45	36	12	53	14		27	54	293
4 NCKR		9	97	36	135	41		88	150	556
5 KRBL			58	50	75		14	32	51	280
6 BLTR	7		20	30	104	39	77	81	94	452
7 TRMR			6	19	12	12	20	37	29	135
8 MRHB		27	151	56	101	28	50	103	168	684
9 HBTB	44	61	32	24	27	8	20	64	60	340
10 TBFC		10	60	49	66	27	40	80	79	411
11 FCCM		1	8	13	11	2	9	5	7	56
12 CMSC			40	50	26				51	167
<b>So Hum Sum</b>	<b>44</b>	<b>99</b>	<b>297</b>	<b>211</b>	<b>243</b>	<b>77</b>	<b>139</b>	<b>289</b>	<b>394</b>	<b>1793</b>
<b>All Sum</b>	<b>156</b>	<b>203</b>	<b>572</b>	<b>379</b>	<b>648</b>	<b>183</b>	<b>230</b>	<b>570</b>	<b>845</b>	<b>3786</b>

800 m	N Birds									
	1989	1990	1991	1992	1993	1994	1995	1996	1997	Sum
1 ORPS			268	167	124			135	299	993
2 PSCB	89	196	84	28	24	23		9	6	459
3 CBNC	424	132	202	104	369	31		94	525	1881
4 NCKR		167	382	198	524	113		131	537	2052
5 KRBL			806	240	935		146	109	263	2499
6 BLTR	1		60	156	472	191	538	188	538	2144
7 TRMR			33	176	113	68	60	84	167	701
8 MRHB		55	407	163	212	29	86	99	242	1293
9 HBTB	186	221	113	34	42	20	46	56	154	872
10 TBFC		36	252	82	136	69	100	43	182	900
11 FCCM		0	7	30	17	3	2	3	40	102
12 CMSC			55	72	13				39	179
<b>So Hum Sum</b>	<b>186</b>	<b>312</b>	<b>867</b>	<b>557</b>	<b>533</b>	<b>189</b>	<b>294</b>	<b>285</b>	<b>824</b>	<b>4047</b>
<b>All Sum</b>	<b>700</b>	<b>807</b>	<b>2669</b>	<b>1450</b>	<b>2981</b>	<b>547</b>	<b>978</b>	<b>951</b>	<b>2992</b>	<b>14075</b>

800 m	Birds/Sample									
	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average
1 ORPS			11.17	6.68	10.33			3.00	3.05	4.87
2 PSCB	1.68	3.92	2.10	1.87	0.92	1.92		1.13	1.50	2.21
3 CBNC	8.15	2.93	5.61	8.67	6.96	2.21		3.48	9.72	6.42
4 NCKR		18.56	3.94	5.50	3.88	2.76		1.49	3.58	3.69
5 KRBL			13.90	4.80	12.47		10.43	3.41	5.16	8.93
6 BLTR	0.14		3.00	5.20	4.54	4.90	6.99	2.32	5.72	4.74
7 TRMR			5.50	9.26	9.42	5.67	3.00	2.27	5.76	5.19
8 MRHB		2.04	2.70	2.91	2.10	1.04	1.72	0.96	1.44	1.89
9 HBTB	4.23	3.62	3.53	1.42	1.56	2.50	2.30	0.88	2.57	2.56
10 TBFC		3.60	4.20	1.67	2.06	2.56	2.50	0.54	2.30	2.19
11 FCCM		0.00	0.88	2.31	1.55	1.50	0.22	0.60	5.71	1.82
12 CMSC			1.38	1.44	0.50				0.76	1.07
<b>So Hum Sum</b>	<b>4.23</b>	<b>3.15</b>	<b>2.92</b>	<b>2.64</b>	<b>2.19</b>	<b>2.45</b>	<b>2.12</b>	<b>0.99</b>	<b>2.09</b>	<b>2.26</b>
<b>All Sum</b>	<b>4.49</b>	<b>3.98</b>	<b>4.67</b>	<b>3.83</b>	<b>4.60</b>	<b>2.99</b>	<b>4.25</b>	<b>1.67</b>	<b>3.54</b>	<b>3.72</b>

2. RSL Marbled Murrelet Data: At Sea  
1400 meter transect

1400 m N Samples

	1989	1990	1991	1992	1993	1994	1995	1996	1997	Sum
1 ORPS			24	24	0			22	105	175
2 PSCB	48	44	36	16	22	11		8	7	192
3 CBNC	31	26	32	8	24	5		20	29	175
4 NCKR		9	111	36	92	24		44	121	437
5 KRBL			60	80	40		16	10	20	226
6 BLTR	0		20	34	47	35	27	51	80	294
7 TRMR			6	16	24	11	23	38	33	151
8 MRHB		28	144	54	116	24	59	91	140	656
9 HBTB	41	62	34	22	40	10	16	56	56	337
10 TBFC		0	63	57	73	16	23	61	92	385
11 FCCM		0	7	12	11	1	3	5	8	47
12 CMSC			48	55	24				31	158
So Hum Sum	41	90	302	216	288	62	124	251	360	1734
All Sum	120	169	585	414	513	137	167	406	722	3233

1400 m N Birds

	1989	1990	1991	1992	1993	1994	1995	1996	1997	Sum
1 ORPS			11	42	0			52	256	361
2 PSCB	64	77	22	9	5	39		4	5	225
3 CBNC	113	123	103	69	19	2		52	236	717
4 NCKR		66	200	132	120	21		34	200	773
5 KRBL			218	105	310		211	14	136	994
6 BLTR	0		76	110	96	78	128	24	169	681
7 TRMR			32	64	81	63	83	86	97	506
8 MRHB		23	269	105	129	21	77	44	154	822
9 HBTB	100	151	64	26	23	11	17	6	124	522
10 TBFC		0	143	110	59	16	30	20	128	506
11 FCCM		0	4	0	8	0	0	0	1	13
12 CMSC			5	13	0				8	26
So Hum Sum	100	174	517	318	300	111	207	156	512	2395
All Sum	277	440	1147	785	850	251	546	336	1514	6146

1400 m Birds/Sample

	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average
1 ORPS			0.46	1.75				2.36	2.44	2.06
2 PSCB	1.33	1.75	0.61	0.56	0.23	3.55		0.50	0.71	1.17
3 CBNC	3.65	4.73	3.22	8.63	0.79	0.40		2.60	8.14	4.10
4 NCKR		7.33	1.80	3.67	1.30	0.88		0.77	1.65	1.77
5 KRBL			3.63	1.31	7.75		13.19	1.40	6.80	4.40
6 BLTR			3.80	3.24	2.04	2.23	4.74	0.47	2.11	2.32
7 TRMR			5.33	4.00	3.38	5.73	3.61	2.26	2.94	3.35
8 MRHB		0.82	1.87	1.94	1.11	0.88	1.31	0.48	1.10	1.25
9 HBTB	2.44	2.44	1.88	1.18	0.58	1.10	1.06	0.11	2.21	1.55
10 TBFC			2.27	1.93	0.81	1.00	1.30	0.33	1.39	1.31
11 FCCM			0.57	0.00	0.73	0.00	0.00	0.00	0.13	0.28
12 CMSC			0.10	0.24	0.00				0.26	0.16
So Hum Sum	2.44	1.93	1.71	1.47	1.04	1.79	1.67	0.62	1.42	1.38
All Sum	2.31	2.60	1.96	1.90	1.66	1.83	3.27	0.83	2.10	1.90

3. RSL Marbled Murrelet Data: At Sea  
Combined transects

All		N Samples									
		1989	1990	1991	1992	1993	1994	1995	1996	1997	Sum
1	ORPS	0	0	48	49	12	0	0	67	203	379
2	PSCB	101	94	76	31	48	23	0	16	11	400
3	CBNC	83	71	68	20	77	19	0	47	83	468
4	NCKR	0	18	208	72	227	65	0	132	271	993
5	KRBL	0	0	118	130	115	0	30	42	71	506
6	BLTR	7	0	40	64	151	74	104	132	174	746
7	TRMR	0	0	12	35	36	23	43	75	62	286
8	MRHB	0	55	295	110	217	52	109	194	308	1340
9	HBTB	85	123	66	46	67	18	36	120	116	677
10	TBFC	0	10	123	106	139	43	63	141	171	796
11	FCCM	0		15	25	22	3	12	10	15	103
12	CMSC	0	0	88	105	50	0	0	0	82	325
	So Hum Sum	85	189	599	427	531	139	263	540	754	3527
	All Sum	276	372	1157	793	1161	320	397	976	1567	7019

All		N Birds									
		1989	1990	1991	1992	1993	1994	1995	1996	1997	Sum
1	ORPS	0	0	279	209	124	0	0	187	555	1354
2	PSCB	153	273	106	37	29	62	0	13	11	684
3	CBNC	537	255	305	173	388	33	0	146	761	2598
4	NCKR	0	233	582	330	644	134	0	165	737	2825
5	KRBL	0	0	1024	345	1245	0	357	123	399	3493
6	BLTR	1	0	136	266	568	269	666	212	707	2825
7	TRMR	0	0	65	240	194	131	143	170	264	1207
8	MRHB	0	78	676	268	341	50	163	143	396	2115
9	HBTB	286	372	177	60	65	31	63	62	278	1394
10	TBFC	0	36	395	192	195	85	130	63	310	1406
11	FCCM	0	0	11	30	25	3	2	3	41	115
12	CMSC	0	0	60	85	13	0	0	0	47	205
	So Hum Sum	286	486	1384	875	833	300	501	441	1336	6442
	All Sum	977	1247	3816	2235	3831	798	1524	1287	4506	20221

All		Birds/Sample										
		For N Samples		GE								Average
		1989	1990	1991	1992	1993	1994	1995	1996	1997		
1	ORPS			5.81	4.27	10.33			2.79	2.73	5.19	
2	PSCB	1.51	2.90	1.39	1.19	0.60	2.70		0.81	1.00	1.39	
3	CBNC	6.47	3.59	4.49	8.65	5.04	1.74		3.11	9.17	4.13	
4	NCKR		12.94	2.80	4.58	2.84	2.06		1.25	2.72	3.78	
5	KRBL			8.68	2.65	10.83		11.90	2.93	5.62	6.16	
6	BLTR	0.14		3.40	4.16	3.76	3.64	6.40	1.61	4.06	2.89	
7	TRMR			5.42	6.86	5.39	5.70	3.33	2.27	4.26	4.14	
8	MRHB		1.42	2.29	2.44	1.57	0.96	1.50	0.74	1.29	1.36	
9	HBTB	3.36	3.02	2.68	1.30	0.97	1.72	1.75	0.52	2.40	1.70	
10	TBFC		3.60	3.21	1.81	1.40	1.98	2.06	0.45	1.81	1.81	
11	FCCM		0.00	0.73	1.20	1.14	1.00	0.17	0.30	2.73	0.57	
12	CMSC			0.68	0.81	0.26				0.57	0.44	
	So Hum Sum	3.36	2.57	2.31	2.05	1.57	2.16	1.90	0.82	1.77	2.06	
	All Sum	3.54	3.35	3.30	2.82	3.30	2.49	3.84	1.32	2.88	2.98	

4. RSL Marbled Murrelet Data

Estimated total population per section

Method of Ralph and Miller, 1995

Coastal segment total =  $6.758 + 4.6102 \times 800 + 4.6241 \times 1400$

Segments GT

0

Sec. Length (2km)	Segment	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average
12	ORPS			724	548				378	385	407
4	PSCB	83	132	77	72	48	128		57	68	75
2	CBNC	122	84	95	173	85	38		70	178	83
9	NCKR		1,136	299	442	276	212		155	278	360
20	KRBL			1,752	699	2,001		2,316	579	1,240	1,225
9	BLTR			343	411	334	357	548	177	386	271
8	TRMR			454	544	526	475	298	222	375	360
13	MRHB		259	362	379	281	203	269	175	240	241
4	HBTB	150	139	127	75	66	93	89	45	115	87
11	TBFC			403	257	220	255	267	118	262	190
4	FCCM			54	70	69	55	31	38	135	40
29	CMSC			394	420	263				333	269
	So Hum Sum	150	398	1,793	1,745	1,425	1,080	955	598	1,460	1,067
	All Sum	355	1,750	5,085	4,090	4,170	1,814	3,820	2,013	3,996	3,010

Population per section with interpolated data for missing years

Sec. Length (2km)	Segment	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average
12	ORPS	724	724	724	548	505	463	421	378	385	541
4	PSCB	83	132	77	72	48	128	92	57	68	84
2	CBNC	122	84	95	173	85	38	54	70	178	100
9	NCKR	1,136	1,136	299	442	276	212	183	155	278	457
20	KRBL	1,752	1,752	1,752	699	2,001	2,159	2,316	579	1,240	1,583
9	BLTR	343	343	343	411	334	357	548	177	386	360
8	TRMR	454	454	454	544	526	475	298	222	375	422
13	MRHB	259	259	362	379	281	203	269	175	240	270
4	HBTB	150	139	127	75	66	93	89	45	115	100
11	TBFC	403	403	403	257	220	255	267	118	262	288
4	FCCM	54	54	54	70	69	55	31	38	135	62
29	CMSC	394	394	394	420	263	280	298	315	333	343
	So Hum Sum	1,714	1,703	1,793	1,745	1,425	1,361	1,253	913	1,460	1,485
	All Sum	5,875	5,875	5,085	4,090	4,675	4,717	4,867	2,328	3,996	4,612

Values in italics are int/extrapolated from nearest survey years.

Summary for three sub-zones

Del Norte	2,065	2,076	1,196	1,234	915	840	750	660	910	1,183
Redw Ntl Pk	2,096	2,096	2,096	1,110	2,336	2,516	2,864	755	1,626	1,944
So Hum	1,714	1,703	1,793	1,745	1,425	1,361	1,253	913	1,460	1,485

Cpal-mmS; DAI

TRA Version: 06/15/98

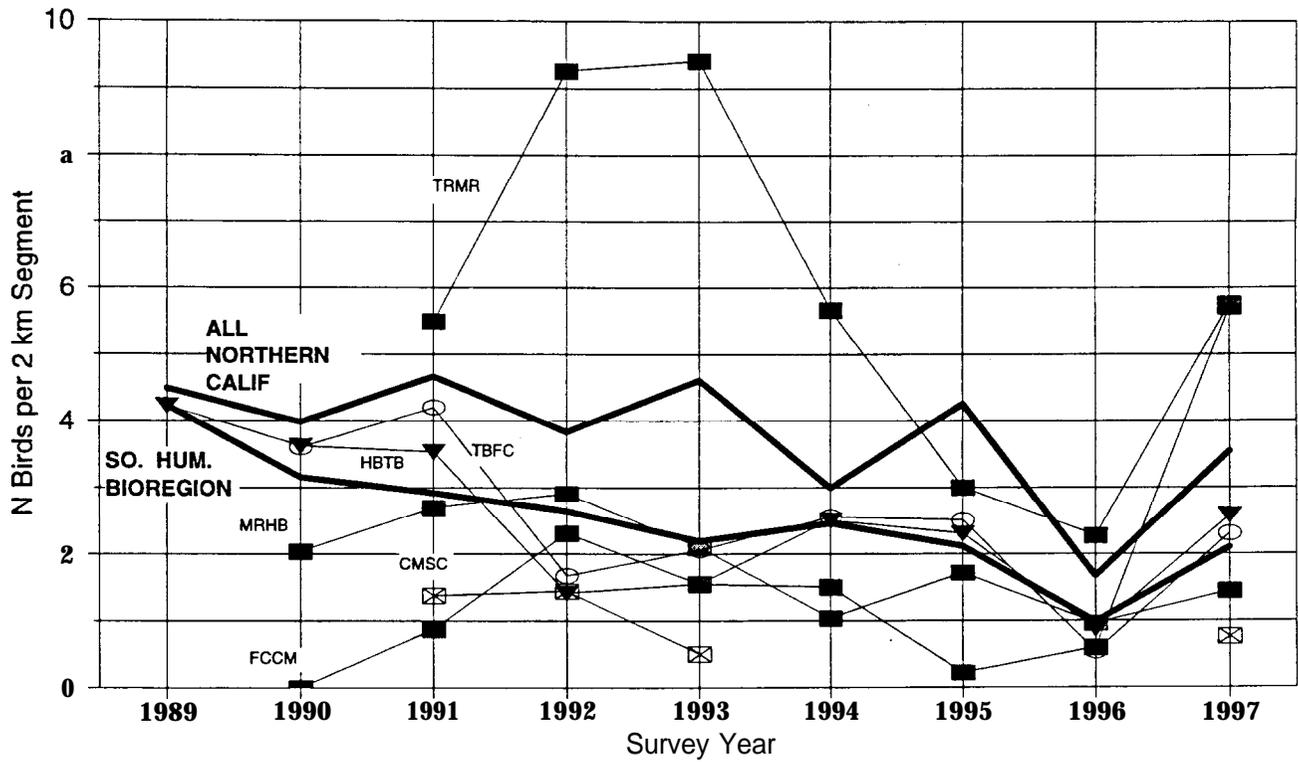
5. RSL Marbled Murrelet Data: At Sea  
 Comparison of 1400 and 800 m transect  
 Value is D1400/D800: Ratio of value at 1400m to value at 800m

All	N Samples	1989	1990	1991	1992	1993	1994	1995	1996	1997	Sum
		1	ORPS			1.00	0.96	0.00			0.49
2	PSCB	0.91	0.88	0.90	1.07	0.85	0.92		1.00	1.75	0.92
3	CBNC	0.60	0.58	0.89	0.67	0.45	0.36		0.74	0.54	0.60
4	NCKR		1.00	1.14	1.00	0.68	0.59		0.50	0.81	0.79
5	KRBL			1.03	1.60	0.53		1.14	0.31	0.39	0.81
6	BLTR	0.00		1.00	1.13	0.45	0.90	0.35	0.63	0.85	0.65
7	TRMR			1.00	0.84	2.00	0.92	1.15	1.03	1.14	1.12
8	MRHB		1.04	0.95	0.96	1.15	0.86	1.18	0.88	0.83	0.96
9	HBTB	0.93	1.02	1.06	0.92	1.48	1.25	0.80	0.88	0.93	0.99
10	TBFC		0.00	1.05	1.16	1.11	0.59	0.58	0.76	1.16	0.94
11	FCCM		0.00	0.88	0.92	1.00	0.50	0.33	1.00	1.14	0.84
12	CMSC			1.20	1.10	0.92				0.61	0.95
	BioR Sum	0.93	0.91	1.02	1.02	1.19	0.81	0.89	0.87	0.91	0.97
	All Sum	0.77	0.83	1.02	1.09	0.79	0.75	0.73	0.71	0.85	0.85

All	N Birds	1989	1990	1991	1992	1993	1994	1995	1996	1997	Sum
		1	ORPS			0.04	0.25	0.00			0.39
2	PSCB	0.72	0.39	0.26	0.32	0.21	1.70		0.44	0.83	0.49
3	CBNC	0.27	0.93	0.51	0.66	0.05	0.06		0.55	0.45	0.38
4	NCKR		0.40	0.52	0.67	0.23	0.19		0.26	0.37	0.38
5	KRBL			0.27	0.44	0.33		1.45	0.13	0.52	0.40
6	BLTR	0.00		1.27	0.71	0.20	0.41	0.24	0.13	0.31	0.32
7	TRMR			0.97	0.36	0.72	0.93	1.38	1.02	0.58	0.72
8	MRHB		0.42	0.66	0.84	0.61	0.72	0.90	0.44	0.64	0.64
9	HBTB	0.54	0.68	0.57	0.76	0.55	0.55	0.37	0.11	0.81	0.60
10	TBFC		0.00	0.57	1.34	0.43	0.23	0.30	0.47	0.70	0.56
11	FCCM			0.57	0.00	0.47	0.00	0.00	0.00	0.03	0.13
12	CMSC			0.09	0.18	0.00				0.21	0.15
	BioR Sum	0.54	0.56	0.60	0.57	0.56	0.59	0.70	0.55	0.62	0.59
	All Sum	0.40	0.55	0.43	0.54	0.29	0.46	0.56	0.35	0.51	0.44

All	Birds/Sample	For N Samples GT		0	1993	1994	1995	1996	1997	Sum
		1989	1990	1991						
1	ORPS			0.04	0.26	0.00		0.79	0.80	0.42
2	PSCB	0.79	0.45	0.29	0.30	0.25	1.85	0.44	0.48	0.53
3	CBNC	0.45	1.61	0.57	1.00	0.11	0.18	0.75	0.84	0.64
4	NCKR		0.40	0.46	0.67	0.34	0.32	0.52	0.46	0.48
5	KRBL			0.26	0.27	0.62		1.26	0.41	1.32
6	BLTR	0.00		1.27	0.62	0.45	0.46	0.68	0.20	0.37
7	TRMR			0.97	0.43	0.36	1.01	1.20	1.00	0.51
8	MRHB		0.40	0.69	0.67	0.53	0.84	0.76	0.50	0.76
9	HBTB	0.58	0.67	0.53	0.83	0.37	0.44	0.46	0.12	0.86
10	TBFC		0.00	0.54	1.15	0.39	0.39	0.52	0.61	0.60
11	FCCM			0.65	0.00	0.47	0.00	0.00	0.00	0.02
12	CMSC			0.08	0.16	0.00				0.34
	BioR Sum	0.58	0.61	0.59	0.56	0.47	0.73	0.79	0.63	0.68
	All Sum	0.51	0.65	0.42	0.50	0.36	0.61	0.77	0.50	0.59
									Mean	0.546
									SE	0.042

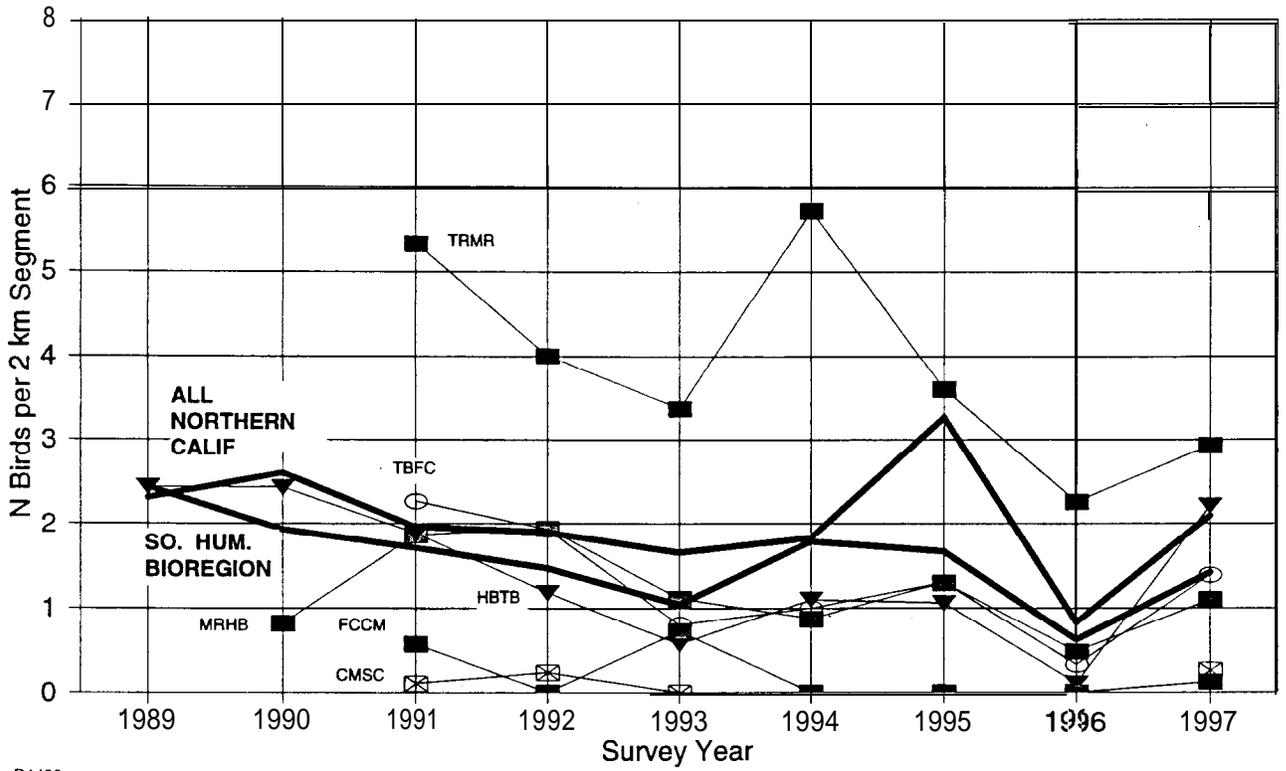
Mean Birds/Sample 800 m Transect  
Southern Humboldt Coastal Sections



Cpal-mmS; 800m  
TRA 06/11/98

Data: Ralph and Miller;  
Analysis: TRA

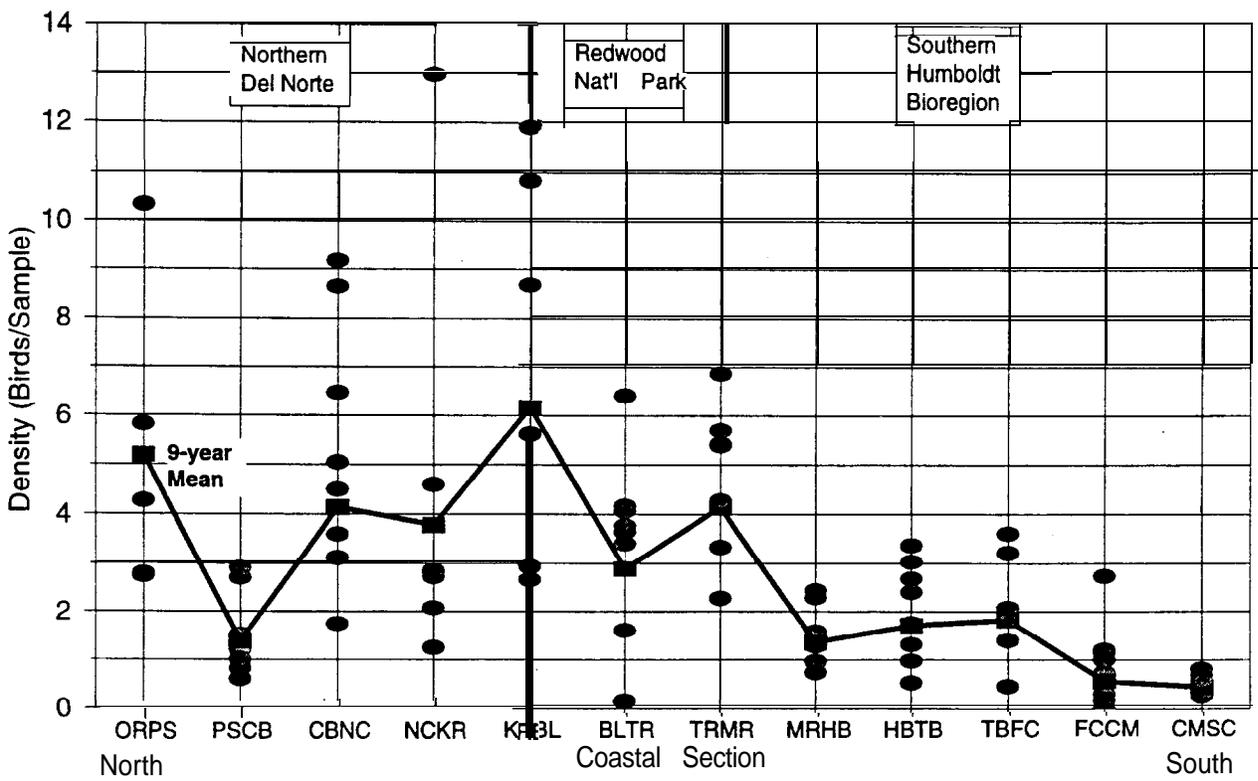
Mean Birds/Sample 1400 m Transect  
Southern Humboldt Coastal Sections



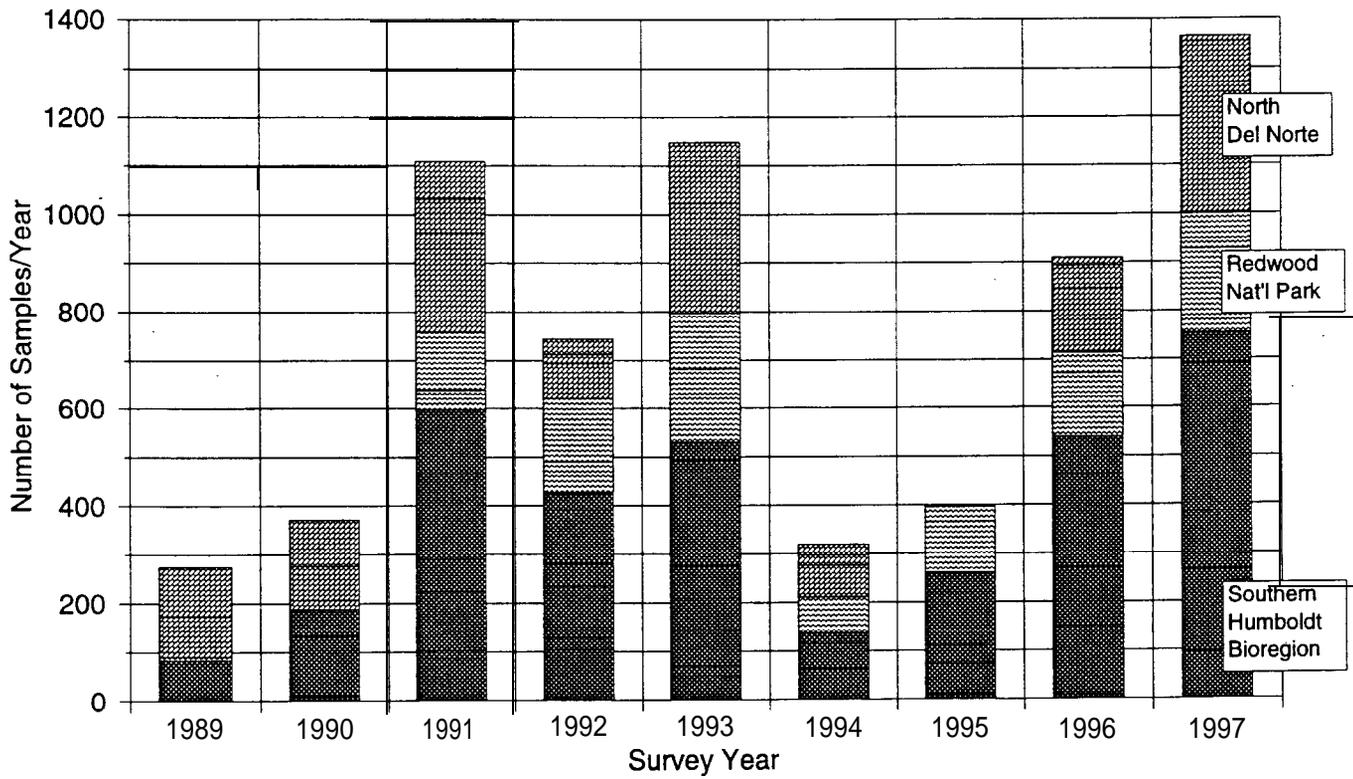
Cpal-mmS; D1400  
TRA 06/11/98

Data: Ralph and Miller;  
Analysis: TRA

Marbled Murrelet Density  
Annual values 1989 - 1997 and Mean



Marbled Murrelet Survey Intensity  
Northern California, at-sea data



pa-mmS; Survey  
RA 06/11/98

Data: Ralph and Miller:  
Analysis: TRA

